

Three-Port Laparoscopic Spleen-Preserving Distal Pancreatectomy with Splenic Vessel Preservation

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ABSTRACT

Laparoscopic distal pancreatectomy is now accepted treatment for benign and certain malignant pancreatic body and/or tail processes and is generally performed using four to six ports. Splenic preservation avoids inherent risks associated with the post-splenectomy state, but adds surgical complexity.

In this case series, we describe our single surgeon's experience with a novel technique for safe, successful three-port laparoscopic spleen-preserving distal pancreatectomy with splenic vessel preservation.

Our series supports success with our technique for a variety of benign and low-grade pancreatic neoplasms. Our results demonstrate this approach is a technically feasible and safe approach. As previously discussed by our group, this approach is also applicable to other procedures in the left upper quadrant.

Key Words: Laparoscopy, Pancreatectomy, Splenic vessel preservation.

INTRODUCTION

Laparoscopic distal pancreatectomy represents an advanced approach that is now accepted treatment for benign and

certain malignant pancreatic body and/or tail processes. Laparoscopic distal pancreatectomy techniques have been previously described in the literature, and traditionally require four to six ports. Each trocar increases the patient's postoperative discomfort, risk for adhesions, bleeding, and port site hernia.

Splenic preservation avoids inherent risks associated with the post-splenectomy state, but adds surgical complexity. Careful dissection of pancreatic branches to preserve splenic vessels and the use of intraoperative ultrasound require significant technical planning. With proper operative patient positioning and strategic port placement, we perform successful laparoscopic spleen-preserving distal pancreatectomy (LSPDP) using a three-port approach. Herein, we describe our novel technique of three-port laparoscopic spleen-preserving distal pancreatectomy with splenic vessel preservation performed by a single surgeon in a series of seven patients over a 10-year period at our institution.

TECHNIQUE

The technique used was described and published by our group in 2011.¹ Here, we describe our technique with splenic preservation. The patient is placed in a modified right thoracoabdominal, decubitus position using a bean bag for support. The patient is then placed in a steep reverse Trendelenburg position with right-side down. The ports are placed along the left anterolateral abdominal wall, with the camera port (10–12-mm trocar) inserted using the Hasson technique at the midclavicular subcostal line (**Figure 1**). Alternatively, the 10–12-mm port is placed in a peri-umbilical location. Five-millimeter trocars are then placed along the left subcostal plane in the subxiphoid and midaxillary positions (**Figure 2**). Port placement can be moved slightly medially in obese patients or in patients that have a short distance between the subcostal margin and the anterior iliac spine.

We use an angled, 30- or 45-degree scope for visualization. A lateral-to-medial approach to mobilize pancreatic parenchyma is performed. The gastrocolic ligament is

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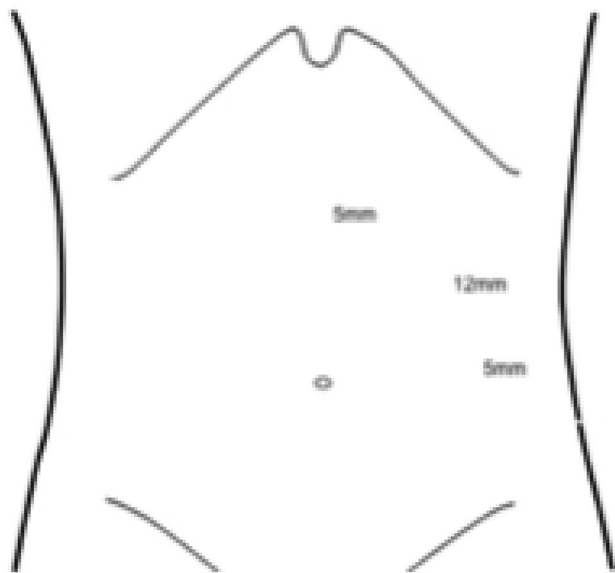


Figure 1. Port positioning with 10–12-millimeter port in left midclavicular position. Alternatively, the 10–12-millimeter port can be placed in peri-umbilical position.

divided, separating the omentum along the greater curvature of the stomach ensuring preservation of the gastroepiploic vasculature superiorly (**Figure 3**). The splenocolic ligament is divided and the splenic flexure is mobilized inferiorly (**Figure 4**). The lesser sac is then entered. The posterior gastric attachments to the pancreas are divided while using the left hand to elevate and retract the stomach anteriorly and superiorly. The inferior border of the pancreas is mobilized beginning at the tail and extended medially taking care to avoid both the duodenum and the inferior mesenteric vein (**Figure 5**). This may prove difficult in particularly thin patients where extreme care must be taken to avoid ligating the thin mesentery in these cases.

To perform splenic vessel preservation, the posterior pancreatic attachments are carefully divided in a lateral-to-medial approach. The splenic artery and vein are then followed distally toward the spleen, taking pancreatic branches with clips and/or an energy device (**Figure 7**).

We then perform intraoperative ultrasound via the 10–12-mm port site. Under ultrasound-guidance, pathology is identified, and the site of pancreatic division is selected (**Figure 6**). The pancreatic tail is then elevated and mobilized anteromedially off of the splenic vessels. Once the site of planned transection is reached, stapled transection is performed. An endoscopic linear stapler is used for

pancreatic transection through the 10- or 12-mm port. This can be done using a 3.5-mm stapling cartridge for a normal thickness pancreas, a 2.5-mm stapling cartridge for a thin pancreas, and a 4.5-mm stapling cartridge for a thick pancreas (**Figure 8**). The staple line is then oversewn with a series of 2-0 or 3-0 silk sutures in an interrupted U-stitch fashion.

Perigastric, peripancreatic, and perisplenic lymph nodes are harvested, to ensure excellent lymphadenectomy.

A sterile specimen bag is inserted, and the specimen is placed in the bag for extraction. The omentum is carefully placed into the dissected space. The stomach is kept in an anterior position before it is placed in its normal anatomic location. A surgical drain is placed laparoscopically into the pancreatic and splenic bed and brought out through the left midaxillary 5 mm port site, again utilizing the strategic port placement (**Figure 9**). The fascia at the 10- or

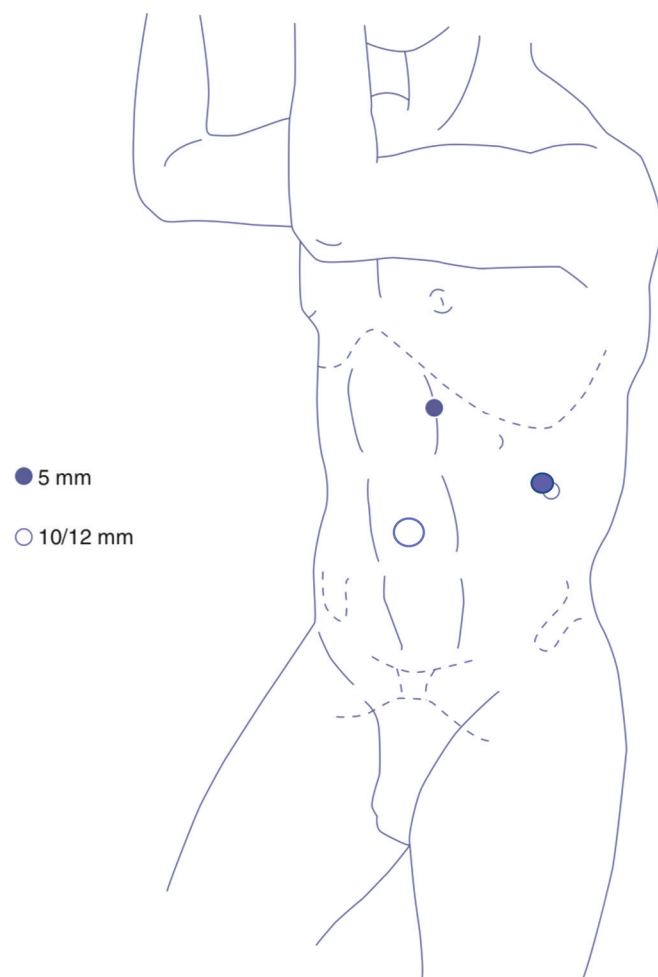


Figure 2. Position of patient and port placement.

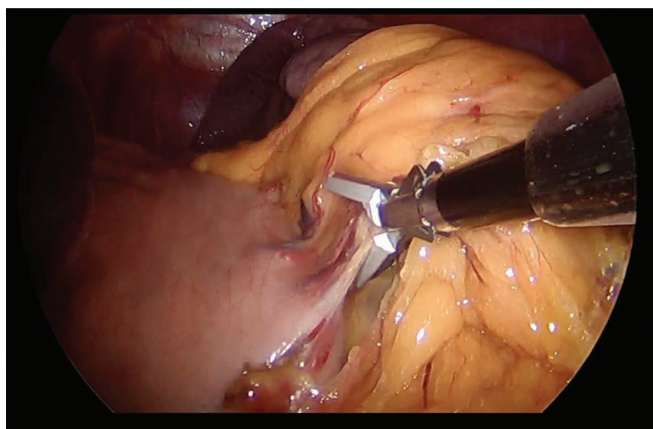


Figure 3. Division of gastrocolic ligament.

12-mm port site is widened to permit the bagged specimen to be extracted. The fascial layers are then closed in the usual fashion.

RESULTS

A total of seven patients underwent three-port laparoscopic spleen-preserving distal pancreatectomy with splenic vessel preservation (Table 1). The average age was 53.1 years (range, 18–69) with a female-to-male ratio of 5:2. The average body mass index (BMI) was 29.4 (range 21–43). The average estimated blood loss was 31.4 mL (range, 5–100 mL). The average operative time was 116 minutes (range, 49–238 minutes). A simultaneous laparoscopic right radical nephrectomy was also performed for a renal cell carcinoma with total duration of procedure 238 minutes. The mean length of stay (LOS) was 4.7 days (range, 3–12 days). The patient with a 12-day LOS

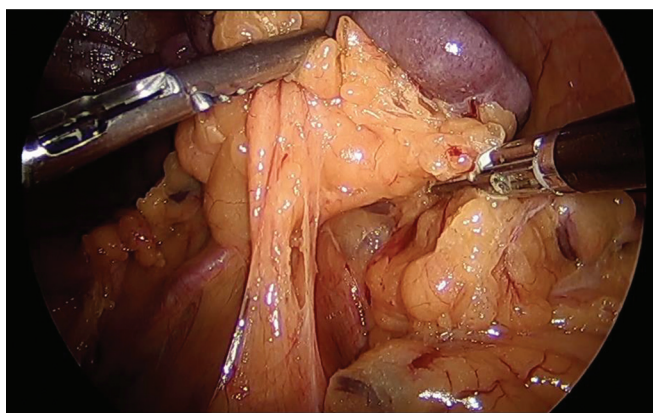


Figure 4. Mobilization and take-down of splenic flexure and splenocolic ligament.

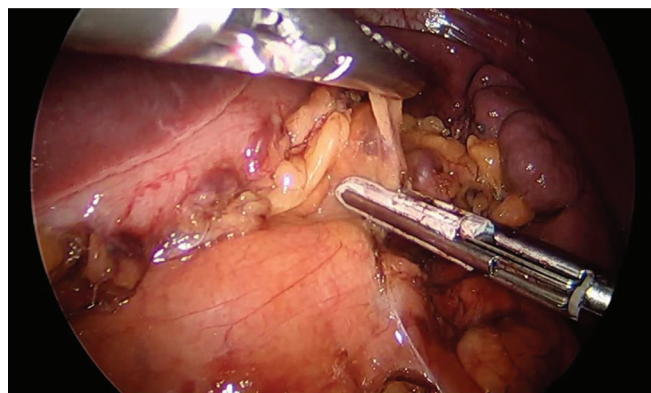


Figure 5. Careful division of inferior pancreatic attachments to avoid injury to mesenteric vessels.

required longer hospitalization due to complex medical comorbidities, including obesity, baseline respiratory conditions, and hypertension. No patients suffered postoperative complications.

The mean pancreatic lesion size was 3.8 cm (range, 0.7–6.5 cm). Final pathology included intraductal papillary mucinous neoplasm, serous cystic neoplasm, pancreatic neuroendocrine tumor, solid pseudopapillary neoplasm, and a lymphoepithelial cyst. All lesions were completely resected with negative margins.

DISCUSSION

Laparoscopic distal pancreatectomy has been shown to improve surgical outcomes compared to the open approach.^{2–5} Laparoscopic distal pancreatectomy techniques have been previously described, and traditionally require four to six ports.^{6,7} Each trocar increases patient

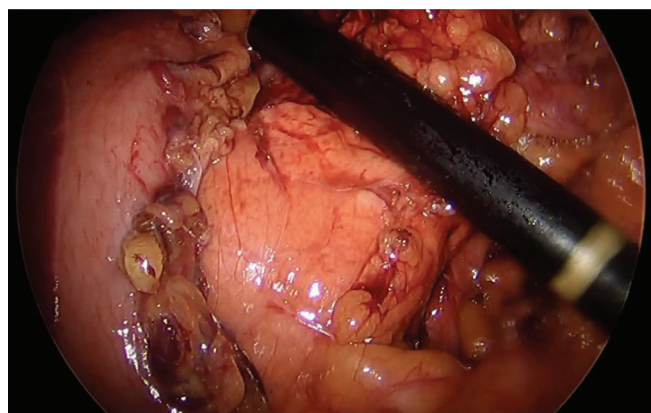


Figure 6. Intraoperative ultrasound, performed through 10-millimeter port site using 5-millimeter laparoscope.

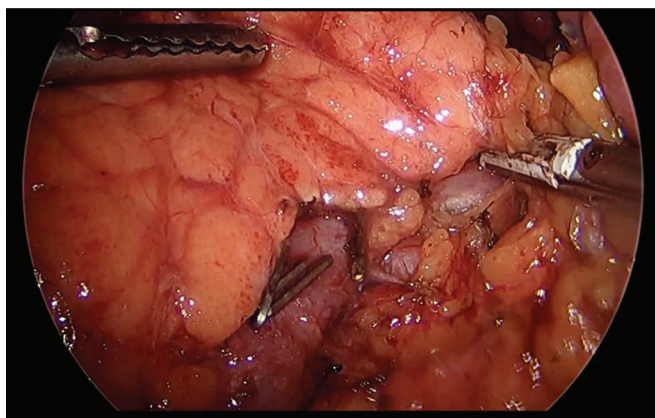


Figure 7. Medial-to-lateral splenic vessel dissection for splenic vessel preservation.

postoperative discomfort, risk for adhesions, bleeding, port site hernia, and other complications.

Moreover, splenectomy carries risks of intraoperative bleeding, thrombocytosis, and infection, including overwhelming post-splenectomy sepsis (OPSI).⁸ LSPDP including both with splenic-vessel preservation and with ligation of splenic vessels (Warshaw technique) have been described.^{9–11} Prior studies have shown the Warshaw technique has been associated with a higher rate of complications, including development of splenic infarction or ischemia, need for splenectomy, and even post-splenectomy sepsis.^{11–12} Therefore, when possible, splenic vessel preservation is the preferred approach to LSPDP. We describe our technique for safe, successful three-port laparoscopic spleen-preserving distal pancreatectomy with splenic vessel preservation.

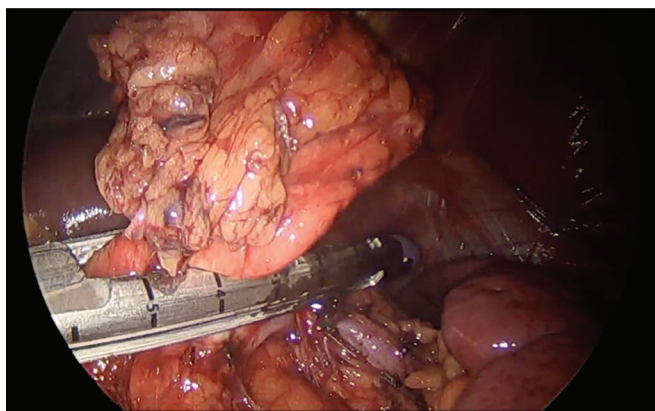


Figure 8. Distal pancreas mobilized and prepared for stapled transection, with preservation of splenic vessels below.

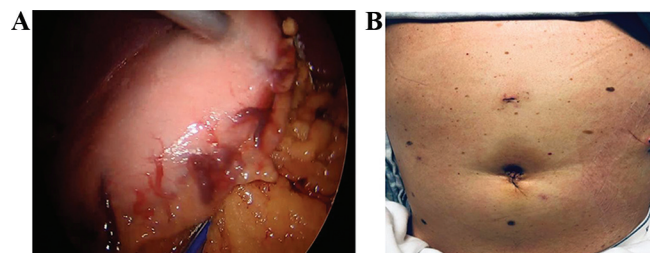


Figure 9. A) Intraoperative placement of omentum and surgical drain in pancreatic and splenic bed. B) Drain brought out through left lower axillary line 5-millimeter port site.

In this case series, we describe our single surgeon's experience with a novel technique for safe, successful three-port LSPDP with splenic vessel preservation. Our results show a mean operative time of 116 minutes, mean estimated blood loss of 31.4 mL and mean LOS of 4.7 days. Average BMI in our case series is 29.4, categorizing as overweight, with one patient having BMI of 43. Four of our patients had prior abdominal surgeries. The patient in our series with the longest LOS had a BMI of 43 and multiple prior abdominal surgeries including hysterectomy and appendectomy. While additional maneuvers were utilized, such as patient positioning or port placement, no additional ports were needed for any patient in our series. None of the patients in our series required conversion to open or to splenectomy. Furthermore, no patients developed clinically significant postoperative pancreatic fistula.

Our data represents a small sample size. However, this study does support success with our technique for a variety of benign and low-grade pancreatic neoplasms. Our technique was selected based solely on preoperative imaging characteristics, as any patients felt likely to have vessel involvement or malignant lesions were deemed inappropriate for splenic preservation. As demonstrated, LSPDP with splenic vessel preservation can be performed using the described three-port approach in a relatively quick and safe fashion with minimal blood loss. The procedure results in fewer scars for the patient compared with the standard procedure, and the safety of the oncological resection does not appear to be compromised.

CONCLUSION

Our approach of three-port LSPDP with splenic vessel preservation is a technically feasible and safe approach. As

Table 1.
Case Series of Patients Undergoing Laparoscopic Spleen-preserving Distal Pancreatectomy with Splenic Vessel Preservation

#	Patient	BMI (kg/m ²)	Indication for Surgery	Operative Time (Min)	EBL (mL)	Complication(s)	LOS (Days)	Final Pathology
1	56F	24	MRI: ~1 x 1 cm cystic lesion in the pancreatic tail CgA 19-9: 106.5 U/mL Cyst fluid CEA: 628.1	121	25	N	3	1.1 x 1.0 x 0.8 cm IPMN with minimal atypia. PanIN-1B
2	18F	21	CT: 3.2 x 2.6 cm exophytic hypodense lesion in pancreatic body MRI: 3.2 x 3.4 x 2.4 cm mass	199	25	N	5	4.0 x 2.1 x 2.0 cm solid pseudopapillary neoplasm
3	69F	32	CT: 7 mm cystic lesion with upstream pancreatic ductal dilatation FNA: possible serous cyst, pancreatic intrapitithelial neoplasia and intraductal mucinous neoplasm	84	20	N	4	6.5 x 5.0 x 2.2 cm IPMN PanIN 1 and 2
4	68F	43	CT: pancreatic tail multicystic lesions	111	25	N	12	6.0 x 3.0 x 1.0 cm IPMN with severe dysplasia PanIN 1A
5	46F	28	CT: incidental 3.2 x 2.6 cm hyperenhancing pancreatic tail mass	49	5	N	3	4.7 x 4.0 x 2.5 cm well-differentiated, low-grade PNET
6	53M	26	CT: pancreatic tail partially cystic versus solid neoplasm CgA: 528	135	20	N	3	4.0 x 4.0 cm Lymphoepithelial cyst

Table 1. Continued

#	Patient	BMI (kg/m ²)	Indication for Surgery	Operative Time (Min)	EBL (mL)	Complication(s)	LOS (Days)	Final Pathology
7	62M	32	CT: large right renal mass and pancreatic tail abnormality in the tip of the pancreas MRI: microcystic subcentimeter pancreatic tail lesion CEA: 3.9	238	100	N	3	0.7 x 0.5 x 0.4 cm unilocular serous cystic neoplasm. PanIN-1 AClear cell renal cell carcinoma

MRI, magnetic resonance imaging; CT, computed tomography; CgA, chromogranin A; CEA, carcinoembryonic antigen; BMI, body mass index; EBL, estimated blood loss; LOS, length of stay; IPMN, intraductal papillary mucinous neoplasm; PanIN, pancreatic intraepithelial neoplasia; FNA, fine needle aspiration; PNET, primitive neuro-ectodermal tumors.

previously discussed by our group, this approach is also applicable to other procedures in the left upper quadrant.

References:

1. Subhas G, Gupta N, Mittal VK, Jacobs MJ. Laparoscopic three-port distal pancreatectomy. *Hpb (Oxford)*. 2011;13(5):361–363.
2. Aly MY, Tsutsumi K, Nakamura M, et al. Comparative study of laparoscopic and open distal pancreatectomy. *J Laparoendosc Adv Surg Tech A*. 2010;20(5):435–440.
3. DiNorcia J, Schrope BA, Lee MK, et al. Laparoscopic distal pancreatectomy offers shorter hospital stays with fewer complications. *J Gastrointest Surg*. 2010;14(11):1804–1812.
4. Kooby DA, Chu CK. Laparoscopic management of pancreatic malignancies. *Surg Clin North Am*. 2010;90(2):427–446.
5. Melotti G, Butturini G, Piccoli M, et al. Laparoscopic distal pancreatectomy: results on a consecutive series of 58 patients. *Ann Surg*. 2007;246(1):77–82.
6. Taylor C, O'Rourke N, Nathanson L, et al. Laparoscopic distal pancreatectomy: the Brisbane experience of forty-six cases. *Hpb (Oxford)*. 2008;10(1):38–42.
7. Hua Y, Yadav D, Bai X, Lia T. Laparoscopic spleen-preserving distal pancreatectomy (LSPDP) with preservation of splenic vessels: an inferior-posterior approach. *Gastroenterology Research and Practice*. 2018;1–7.
8. Schwartz PE, Sterioff S, Mucha P, Melton LJ, Offord KP. Postsplenectomy sepsis and mortality in adults. *JAMA*. 1982;248(18):2279–2283.
9. Pais-Costa SR, de Sousa GC, Araujo SLM, Lima O. Laparoscopic distal pancreatectomy with spleen preservation. *Arq Bras Cir Dig*. 2018;31(3):e1395.
10. Yan J, Xu X, Jin W, et al. Laparoscopic spleen-preserving distal pancreatectomy for pancreatic neoplasms: a retrospective study. *World J Gastroenterol*. 2014;20(38):13966–13972.
11. Kimura W, Yano M, Sugawara S, et al. Spleen-preserving distal pancreatectomy with conservation of the splenic artery and vein: techniques and its significance. *J Hepatobiliary Pancreat Sci*. 2010;17(6):813–823.
12. Partelli S, Cirocchi R, Randolph J, Parisi A, Coratti A, Falconi M. A systematic review and meta-analysis of spleen-preserving distal pancreatectomy with preservation or ligation of the splenic artery and vein. *Surgeon*. 2016;14(2):109–118.